TFW
2834

PATENT APPLICATION

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of

Daping CHU

Group Art Unit: 2834

Application No.: 09/866,740

Examiner: K. Addison

Filed: May 30, 2001

Docket No.: 109678

For: PIEZOELECTRIC DEVICES

REQUEST FOR RECONSIDERATION

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

In reply to the March 29, 2004 Office Action, reconsideration of the rejection is respectfully requested in light of the following remarks.

Claims 1-15 are pending herein.

I. Rejection under 35 U.S.C. §102(b)

Claims 1, 2, 6-7 and 11-15 were rejected under 35 U.S.C. §102(b) as allegedly being anticipated by UK Patent Application No. GB 2,284,298 (hereinafter "Butcher"). However, after making this initial rejection, the Office Action then references Figures 8, 11 and 3 of "Lee" when describing the specific rejection. The Office Action continues to refer to "Lee" throughout the rejection. Because the Office Action continuously refers to "Lee" and because there are no Figures 8 or 11 in Butcher, Applicant believes the rejection of the claims is made with reference to U.S. Patent No. 4,868,447 (hereinafter "Lee").

Applicant's representative telephoned the Examiner on July 26 in an attempt to confirm that the rejection is meant to be made with reference to Lee, but was not able to reach the Examiner.

As such, Applicant has interpreted the rejection to be made with reference to Lee and responds herein accordingly.

The Office Action references Figures 3, 8 and 11 of Lee and alleges that Lee discloses a device having a piezoelectric material layer and a ferroelectric material (3, 2, 1) clamped together (62). However, the principle device disclosed by Lee is fundamentally different than that presently claimed.

Claim 1 recites a device comprising a piezoelectric material layer and a ferroelectric material layer clamped together, the ferroelectric material layer having a predetermined direction of polarization and means for providing an input signal to one layer for causing an induced output signal from the other layer without causing a change in the predetermined direction of polarization, the induced output signal from the other layer having a phase determined by the predetermined direction of polarization.

Claim 13 recites a method of operating a device having a layer of piezoelectric material and a layer of ferroelectric material clamped together, the ferroelectric material layer having a predetermined direction of polarization. The method comprises applying an input signal to one of the layers without causing a change in the predetermined direction of polarization and causing an output signal from the other layer having a phase determined by the predetermined direction of polarization.

Claim 15 recites a device comprising a piezoelectric material layer and a ferroelectric material layer clamped together, the ferroelectric material layer having a predetermined direction of polarization and a device to provide an input signal to one layer causing an induced output signal from the other layer without causing a change in the predetermined

direction of polarization, the induced output signal from the other layer having a phase determined by the predetermined direction of polarization.

The claims of the present application are not taught or suggested by Lee.

As described in the specification of the present application, only d33 is used and the present invention is directed to movement along the z-direction. The equations in the specification of the present application reflect the fact that only movement along the z-direction is considered. Accordingly, only the tension along the z-direction, T_3, is important to the performance of the device of the present invention. This is consistent with the use of materials such as piezoelectric material (PZT), as recited in the claims, which has a large d33.

Further, the claims of the present application recite rigid clamps along a predetermined direction (the z-direction according to the specification). Because of the clamps, the relative movement of each layer along the z-direction is under a confined condition and hence the desired performance can be obtained.

Contrary to the assertions made by the Patent Office, Lee teaches away from the present application.

More specifically, the device of Lee only senses the in-plane movements along the x and y direction, for example, by bending, stretching and twisting components. The electrical signal is detected in the z-direction. Accordingly, Lee only uses d31 and d32, but not d33. For example, it is noted in the specification of Lee that although d33 does appear in the general expression (see equation 7, col. 7) it is set as zero from Equation 9 onwards.

Further, the tension T_3 along the z-direction is explicitly assumed to be several orders of magnitude less than the values of T_1 and T_2 which are induced by the bending. Hence, the tension along the z-direction which is normal to the plane of the layered structure is not considered. See col. 8, lines 42-62 of Lee.

This is also consistent with the material properties of PVDF cited in the description. The d33 of PVDF is about 33pC/N, which is smaller than the d33 of PZT in the present invention, which is 289pC/N. That is, using PVDF, as disclosed in Lee, is not an efficient way to detect the movement along the z-direction.

Further, there are no clamps mentioned along the z-direction in Lee. This is particularly important for an effective detection of tension along the z-direction.

Further still, the limitation of only detecting in-plane movements is clearly emphasized throughout the claims in Lee.

Furthermore, according to Lee, there should be a phase difference between the mechanical movement of the part and the sensor output. This is demonstrated in Fig. 13 of Lee. Here, the phase difference, in which the potential meter signal is used to drive to twist the PVDF signal, is the sensing output. The disclosed phase difference in Lee is about 5°, which is vastly different from the out of phase output of 180° according to the present invention.

Not only are there basic principle differences in the phase difference between the present invention and Lee, there are also operational differences. In Lee, the operation is mainly converting mechanical movement of the electrical signals, whereas in the present invention, the operation is mainly electrical to electrical signals.

For at least the forgoing reasons, Applicant submits that Lee teaches away from the invention of claims 1-15 and the rejections made in the Office Action are overcome. Accordingly, Applicant respectfully submits that Lee fails to anticipate the subject matter of claims 1-15.

Reconsideration and withdrawal of this rejection are thus respectfully requested.

II. Response to Arguments

Applicants disagree with the Patent Office's response to arguments submitted in the Request for Reconsideration filed on December 19, 2003.

In paragraph 3 of the Office Action, the Patent Office alleges that Lee shows in Figs. 8 and 23 an input voltage signal causing an output signal on layer 1 which has a phase which is determined by the predetermined direction of the polarization (arrow) of the ferroelectric layer (3).

However, Fig. 8 of Lee illustrates the angles θ1 and θ3 are the directions of polarization in the corresponding layers. In Fig. 23 of Lee, a closed loop feedback system is described but the phase control is through an external inverter and not the polarization direction. In col. 41, lines 1 to 49, Lee only describes the active damper set-up in Fig. 23. Using an inverter in the circuitry clearly demonstrates the out of phase feedback needed for damping which is effected by the inverter. Lee at col. 37, lines 44 to 52 discloses that the polarization profile P(x,y) as well as Equation 138 from which it is clearly shown that the polarization profile P(x,y) only effects the average displacement. No phase relation is explicitly described or implied. More explicitly, even in this case, only the in-plane polarization is mentioned.

Furthermore, Lee fails to even mention polarization switching to control the output phase relationship.

Again, as described in more detail above, Lee simply fails to anticipate the subject matter of claims 1-15.

III. Allowable Subject Matter

The Office Action alleges that claims 3-5 and 8-10 have no structural limitation. However, the Patent Office again fails to make any specific rejection of claims 3-5 and 8-10. As no specific rejection of claims 3-5 and 8-10 has been made, Applicant assumes that each of claims 3-5 and 8-10 is in condition for allowance.

Notice to this effect is respectfully requested.

IV. Conclusion

In view of the foregoing, it is respectfully submitted that this application is in condition for allowance. Favorable reconsideration and prompt allowance of claims 1-15 are earnestly solicited.

Should the Examiner believe that anything further would be desirable in order to place this application in even better condition for allowance, the Examiner is invited to contact the undersigned at the telephone number set forth below.

Respectfully submitted,

James A. Oliff
Registration No. 27,075

Linda M. Saltiel
Registration No. 51,122

JAO:LMS/hs

Date: July 29, 2004

OLIFF & BERRIDGE, PLC
P.O. Box 19928
Alexandria, Virginia 22320
Telephone: (703) 836-6400

DEPOSIT ACCOUNT USE AUTHORIZATION
Please grant any extension necessary for entry;
Charge any fee due to our Deposit Account No. 15-0461